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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Robert B. Hope

Serial No.: 10/033,518

Filed: December 28, 2001

For: WEATHER SEAL HAVING ELASTOMERIC MATERIALS ENCAPSULATING A BENDABLE CORE

Examiner: Jerry E. Redman Art Unit: 3634

Atty. Docket: ULB-003CV

RESPONSE TO ACTION DATED 10/20/2004

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Reference is made to the Second Supplemental Appeal Brief, page 2, Status of Amendments. The Examiner, after two years of prosecution, has cited another new reference, Japanese Patent, Iwasa et al. "Iwasa.". Why the Iwasa reference was not previously cited is not explained. It is clearly unfair to prosecute a case to final rejection and appeal, and then cite a new reference. Moreover, such late citation of a new reference raises the presumption that it was previously considered and disregarded as not relevant, perhaps for the reasons noted below.

A translation of the Iwasa patent is enclosed.

While Iwasa uses new rubber, it is merely coated with crushed vulcanized rubber and the composite is pressure molded to provide a molding of the composite material.

The concept of covering a substrate over a core with a covering of "virgin elastomeric material" to provide a sealing surface is not present in Iwasa. Since Iwasa vulcanizes the entire body under pressure, a new element is formed, and the "covering" is gone. There is nothing to teach the art to use a covering of virgin material to provide a seal. Certainly the use of tapes of the elastomeric material are not foreshadowed (Claims 3, 4, and 8).

The foregoing will be apparent from a reading of the Iwasa translation.

The Examiner, it is respectfully submitted, misconstrues Keys and Vinay. This is pointed out in the Supplemental Brief on page 6 for Keys and page 7 for Vinay. Set out in full for the Examiner's convenience hereinafter.

> The Examiner is also in error in the new non-final action as to his interpretation of Keys. Keys shows no encapsulation layers, Layer 17 butt against the end of Layer 21 at a butt joint 32. Layer 17 is of thermo setting material (noted as EPDM-apparently virgin material). Layer 21 is of thermo plastic (PVC). There are no tapes of recycled EPDM in the Keys seal. There is no encapsulating cover of virgin EPDM.
>
> The Examiner is in error in applying the Vinay patent in that the patent shows only a woven warp of threads including a wire and a meltable thread. This patent is discussed and distinguished from the invention claimed by Appellant on page 2, first full paragraph of the specification as filed. Certainly the patent does not teach anything about the core encapsulating layers of recycled and virgin elastomeric material. The warp is not on one side of the core, but is woven around the core wire. Thus, Claims 5, 6, 7, 8, 9, and 10 clearly distinguish by virtue of the unique location of the reinforcing elements unforeshadowed in any reference of record.

Keys' layers are side by side, not in "encapsulating" relationship as contended by the Examiner in constructing his rejection. The rejection is, for the reason above, not well taken.

Applicant's invention goes well beyond using a wire loop core as in Vinay.

The Examiner overlooks process limitations in Claims 5-7, 9 and 10.

It was brought to the Examiner's attention in the Response dated February 11, 2003 to the Action of January 23, 2003 (page 2 and in the Supplemental Appeal Brief in the paragraph bridging pages 2 and 3), that these claims were proper as product by process claims.

Accordingly, and for the foregoing reasons, the Examiner's rejection under 35 U.S.C. §112 in the first paragraph of page 2 of the October 20, 2004 Action, and the rejections under 35 U.S.C. §103 should be withdrawn. Further, as to the 35 U.S.C. §103 rejections, they are improper combinations of references. Where the combination is not drawn from the references, but can be found only in Applicant's disclosure, the rejection is improper as being based on hindsight as stated in the Supplemental Appeal Brief.

It is beyond peradventure that there is nothing except Applicant's disclosure to suggest (i.e., in hindsight) using a substrate of recycled material over a core covered by an encapsulating layer, let alone specifically as claimed. Clearly, the combination of references is improper under a long line of cases recently including In re Vaeck, 20 U.S.P.Q. 2d 1438, 1442 (Fed. Cir. 1991).

Withdrawal of the rejections and passage to Issue is respectfully solicited.

Respectfully submitted,

Dated: December 7, 2004

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Enclosure: Translation of Iwasa patent

CERTIFICATE OF MAILING BY FIRST CLASS MAIL (37 CFR 1.8)	Docket No.
Applicant(s): **Robert B. Hope**	**ULB-003CV**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit
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Invention: **WEATHER SEAL HAVING ELASTOMERIC MATERIAL ENCAPSULATING BENDABLE CORE**

O I P E JC130 DEC 1 0 2004 PATENT & TRADEMARK OFFICE

I hereby certify that this **RESPONSE TO ACTION DATED 10/20/2004**

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is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on **December 07 , 2004**.

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(54) [Title of Invention] **Method of Recycling Waste Rubber**

(57) [Abstract]

[Purpose] Providing a technique for recycling waste rubber that blends large amounts of vulcanized crushed rubber with unvulcanized new rubber so that the waste rubber may be reused more efficiently.
[Structure] Technique for recycling waste rubber whereby waste rubber is crushed and then the vulcanized crushed rubber is used together with new rubber. Regenerated rubber molded products are formed by pressurized vulcanization molding while the vulcanized crushed rubber [13] is encased by the unvulcanized new rubber [11].

[words in the figure] Vulcanized Crushed Rubber

[Patent Claim]
[Claim 1] Method of recycling waste rubber characterized by crushing waste rubber to obtain crushed vulcanized rubber, followed by the formation of regenerated rubber molded products by pressurized vulcanization molding while the vulcanized crushed rubber is encased by unvulcanized new rubber.
[Claim 2] Method of recycling waste rubber as described in Claim 1, characterized by the fact that the vulcanized crushed rubber is a non-diene sulfur vulcanized rubber and the unvulcanized new rubber is a diene rubber.
[Claim 3] Regenerated rubber molded products characterized by the fact that they are formed by pressurized vulcanization molding in which vulcanized crushed rubber is encased by unvulcanized new rubber.
[Claim 4] Method of recycling waste rubber as described in Claim 1, characterized by the fact that the vulcanized crushed rubber is a non-diene sulfur vulcanized rubber and the unvulcanized new rubber is a diene rubber.[1]

[Detailed Description of the Invention]
[0001]
[Industrial Field of Application] This invention concerns a new method of reusing waste rubber that effectively uses waste rubber with high efficiency. In particular, this invention is ideal for rubber products used for sealing, such as window frame rubber, piston caps, gaskets, and grommets, which require sealability and surface characteristics that provide a desired external appearance, and it is also ideal for automobile parts such as hoses and column covers.
[0002] The following are abbreviations for the rubber polymers used in this specification.
[0003]

ACM	acrylic rubber
CR	chloroprene rubber
EPDM	amorphous ethylene propylene non-conjugated diene terpolymer
NBR	nitrile rubber
NBR/PVC	nitrile rubber/polyvinyl chloride blend
SBR	styrene butadiene rubber
NR	natural rubber

[0004]
[Current Technology] During vulcanization molding of rubber forms, other items such as runners, gates, and fins are produced in addition to the molded product, and these generate large amounts of waste rubber. It is necessary to recycle this rubber in order to conserve resources.
[0005] One method of recycling waste rubber has been to crush the waste rubber into vulcanized crushed rubber (usually with particle diameters under 500 μm), then knead this vulcanized crushed rubber with unvulcanized new rubber into a compound rubber material for molding (usually, in the form of sheets).
[0006]
[Problem Solved by the Invention] However, when this compound rubber material for molding is obtained by kneading, if the amount of vulcanized crushed rubber is large then it can easily cause the kneading roll to float (due to the high resilience of the vulcanized crushed rubber itself), so that problems arise in the ability to perform rolling. Accordingly, the amount of vulcanized crushed rubber in the unvulcanized new rubber (the blended ratio) is usually limited to about 10%, so that the efficiency of recycling the waste rubber is poor.
[0007] Considering this, this invention aims to provide a method of recycling waste rubber that blends large amounts of vulcanized crushed rubber into unvulcanized new rubber so that the waste rubber may be recycled more efficiently.
[0008] Another purpose of this invention is to provide a method of recycling waste rubber that attempts to reduce the amount of vulcanizing agents used when a new rubber and a vulcanized crushed rubber are combined.
[0009]
[Means of Solving the Problems]

(1) The method of recycling waste rubber in this invention, as described in Claim 1, solves the above problem in the following way.

[0010] Waste rubber is crushed to obtain crushed vulcanized rubber. This is followed by the formation of regenerated rubber molded products by pressurized vulcanization molding in which the vulcanized crushed rubber is encased by unvulcanized new rubber.

[0011] (2) The method of recycling waste rubber in this invention as described in Claim 2 solves the problem described above in the following way.

[0012] The vulcanized crushed rubber described in Claim 1 is a non-diene sulfur vulcanized rubber and the unvulcanized new rubber is a diene rubber.

[0013]

[Form of Application] We will explain in detail the method of recycling waste rubber in this invention (see Figure 1).

[0014] (1) First, waste rubber (such as sprue runners or fins generated by molding) is crushed to obtain the vulcanized crushed rubber [11].

[0015] The particle size of this vulcanized crushed rubber is usually from 0.001 to 1 mm (preferably, from 0.05 to 0.5 mm). If it is less than 0.001 mm then difficulties arise with the crushing technology, and if it is greater than 1 mm then problems tend to occur with cohesion during the pressurized vulcanization molding, as discussed later, and it is difficult to obtain a smooth surface.

[0016] The method of crushing the waste rubber is a standard crushing method, such as a cutter mill or grinder roll.

[0017] (2) Next, form the regenerated rubber molded product by pressurized vulcanization molding in which the vulcanized crushed rubber is encased by unvulcanized new rubber (or just "new rubber").

[0018] Here, one example for the surrounding unvulcanized new rubber, as shown in Figure 1, is to extract the unvulcanized new rubber into a cylindrical shape [11], close one end (it adheres because it is unvulcanized) to form a sack, fill this sack with the vulcanized crushed rubber [13], and close it. Or, one could also use unvulcanized sheets to wrap up the vulcanized crushed rubber.

[0019] In such cases the thickness of the unvulcanized new rubber is usually from 0.2 to 3 mm, preferably from 0.5 to 2 mm. If it is less than 0.2 mm then it is difficult to obtain the desired surface characteristics (smoothness), and if it is greater than 3 mm then the relative blended ratio of the vulcanized crushed rubber is low, making it difficult to realize a high level of efficiency in using the waste rubber, which is the effect of this invention.

[0020] With regard to the types of rubber and their combinations, the vulcanized crushed rubber and the unvulcanized new rubber are usually the same type of rubber, but they may also be different types of rubber. When they are different types of rubber it is preferable for the unvulcanized new rubber to be a non-diene sulfur vulcanized rubber and for the vulcanized crushed rubber to be a non-diene sulfur vulcanized rubber. Or, it is also good if the polarity of the unvulcanized new rubber is about the same as that of the vulcanized crushed rubber.

[0021] We show a summary of the combinations in Table 1, where O indicates a preferable combination (the polarities are similar for the two rubbers, or, the new rubber is a diene rubber and the crushed rubber is a non-diene sulfur vulcanized rubber), Δ indicates a usable combination, and X indicates a combination that cannot be used (the new rubber is a non-diene sulfur vulcanized rubber and the crushed rubber is a diene rubber).

[0022] For the combinations that cannot be used, where the vulcanized crushed rubber is a diene rubber and the unvulcanized new rubber is a non-diene rubber, the problem is not just that there is no migration of vulcanizing agent from the vulcanized crushed rubber to the unvulcanized new rubber, but moreover, even if a vulcanizing agent is blended into the unvulcanized new rubber, the vulcanizing agent tends to migrate to the diene rubber, so vulcanization is poor.

[0023] When the new rubber is a diene rubber and the crushed rubber is a non-diene vulcanized rubber, during vulcanization molding there is strong migration of the vulcanizing agent remaining in the vulcanized rubber to the diene rubber, so enabling a reduction in the amount of vulcanizing agent used in the new rubber.

[0024] The method of pressurized vulcanization molding can be either compression molding (see the figures) or transfer molding.

[0025] Applicable rubber molded products include sealing rubber products such as window frame rubber, piston caps, gaskets, and grommets, and automobile parts such as hoses and column covers.

[0026]

[Operation and Effect of the Invention]
(1) The method of reusing waste rubber in this invention as described in Claim 1 is characterized by crushing waste rubber to obtain crushed vulcanized rubber, followed by the formation of regenerated rubber molded products through pressurized vulcanization molding, thereby combining ① cohesion among the particles of the vulcanized crushed rubber and ② vulcanization adhesion between the cohering vulcanized crushed rubber and the surface layers of the new rubber (cross-linking).
[0027] Therefore, it is possible to obtain an attractive surface, with good properties, in a regenerated rubber molded product that is not very different from new rubber, but involving a relatively high amount of vulcanized crushed rubber.
[0028] Accordingly, the method of recycling waste rubber in this invention has the effect of blending large amounts of vulcanized crushed rubber into unvulcanized new rubber so that the waste rubber may be reused more efficiently.
[0029] (2) The method of recycling waste rubber in this invention as described in Claim 2 is one in which the vulcanized crushed rubber of Claim 1 is a non-diene sulfur vulcanized rubber (such as EPDM) and the unvulcanized new rubber is a diene rubber (such as NR, SBR, or NBR), so that the (polar) vulcanizing agent remaining in the non-diene sulfur vulcanized rubber of the vulcanized crushed rubber will readily migrate to the unvulcanized new rubber, which is a diene rubber. Therefore, even if no vulcanizing agent is blended into the new rubber the new rubber will be vulcanized, and at the same time there will be vulcanized adhesion at the surface between the cohering crushed vulcanized rubber and the new rubber.
[0030] Therefore, it becomes easier to prepare the secondary components to blend into the new rubber, since it is not necessary to blend a vulcanizing agent into the new rubber.
[0031] Furthermore, by combining different types of rubber it is possible to provide for desireable surface properties in the new rubber, which is the surface layer portion, and good structural properties in the cohering crushed vulcanized rubber, which is the core portion, so one can anticipate compound rubber molded products with properties not present with the existing technology.
[0032]
[Sample Experiments] Next, we explain practical examples and comparative examples to confirm the effects of this invention. The units of blending are parts by weight, although there is no particular reason for using only this.
[0033] The following are the blending formulas for the EPDM and NBR rubbers used in all the experimental examples.
[0034]

EPDM Blending Formula

JSR EP57C (EPDM manufactured by Japan Synthetic Rubber)	100 parts
Zinc oxide #3	5 parts
Stearic acid	1 part
Carbon black FEF	150 parts
Heavy calcium carbonate	70 parts
Paraffin process oil	130 parts
Vulcanization promoting agent TMTD	2 parts
Vulcanization promoting agent MBT	1 part
Sulfur	2 parts

NBR Blending Formula

JSR N230 (NBR manufactured by Japan Synthetic Rubber)	100 parts
Zinc oxide #3	5 parts
Stearic acid	2 parts
Carbon black SRF	150 parts
Light calcium carbonate	50 parts
DOP	50 parts
Vulcanization promoting agent TMTD	2 parts
Vulcanization promoting agent CBS	1 part
Sulfur	1 part

<Sample Experiment 1> We used vulcanized rubber formed through pressurized vulcanization molding (170 °C, 10 minutes, 10 MPa) with compression molding of the rubber blends given by the above blending formulas to obtain the respective vulcanized crushed rubber, crushed by a cutter mill process, with an average particle diameter of 0.4 mm.

[0035] We extracted, molded and cut the new rubber produced by the above blending formulas into hollow shapes (outer diameter 15 mm, thickness 1 mm), closed one end to form a sack, filled it with vulcanized crushed rubber of the same respective formula in the weight proportions shown in Tables 2 and 3, sealed it, and performed pressurized vulcanization molding with compression molding (170 °C, 10 minutes, 10 MPa) of 150 mm □ by 3 mm t molded products.

[0036] We similarly obtained rubber molded products through pressurized vulcanization molding of unvulcanized new rubber of the respective blending formulas to create reference examples 1 and 2, and of kneaded mixtures of vulcanized crushed rubber into unvulcanized new rubber of the same respective formulas (limited in practice to 10%) to create comparative examples 1 and 2.

[0037] For each rubber molded product, we performed each of the indicated physical experiments according to JIS K 6301, and then measured the surface roughness according to JIS B 0601.

[0038] Based on the results shown in Table 2 (EPDM/EPDM) and Table 3 (NBR/NBR), this invention demonstrates surface properties comparable to those of products formed from pure new rubber, even when a large amount (over 50%) of crushed vulcanized rubber is blended in, and we see that the normal physical properties are generally unchanged.

[0039] <Sample Experiment 2> This was the same as Sample Experiment 1 but with the new rubber and the vulcanized crushed rubber combined, as different types, with the same blended ratios (the blended ratio of vulcanized crushed rubber was 50%). In this case, we used new rubber from which the vulcanizing agent and sulfur had been removed.

[0040] When we combined EPDM as the vulcanized crushed rubber with NBR as the unvulcanized new rubber the NBR surface layer resulted in an attractive molded product that was sufficiently vulcanized. The following are the results of tests for physical properties.

[0041]

Hardness (JIS-A):	71
Tensile strength (MPa):	11.0
Elasticity (%):	350
Surface roughness (Rz):	6

In the opposite case, when we combined NBR as the vulcanized crushed rubber with EPDM as the unvulcanized new rubber, poor vulcanization occurred in the EPDM surface layer (solids remained), therefore we could not perform the various physical measurements.

0042. Table 1.

	Crushed Rubber							
New Rubber	EPDM (Sulfur)	EPDM (P/O)	NR	SBR	CR	ACM	NBR	NBR/ PVC
EPDM (Sulfur)	O	O	X	X	X	Δ	X	X
EPDM (P/O)	O	O	O	O	Δ	Δ	Δ	Δ
NR	O	O	O	O	Δ	Δ	Δ	Δ
SR	O	O	O	O	O	Δ	Δ	Δ
CR	O	Δ	Δ	O	O	O	O	O
ACM	Δ	Δ	Δ	Δ	O	O	O	O
NBR	O	Δ	Δ	Δ	O	O	O	O
NBR/PVC	O	Δ	Δ	Δ	O	O	O	O

0043. Table 2.

EPDM/EPDM

	Ref. Ex. 1	Comp. Ex. 1	Practical Examples 1	2	3	4	5
Crushed Rubber Blended Ratio	0 wt %	10 wt %	10 wt %	30 wt %	50 wt %	70 wt %	90 wt %
Physical Properties:							
Hardness (JIS-A)	62	63	61	61	63	62	61
Tensile Strength (MPa)	10.5	9.6	10.3	9.6	9.1	8.4	7.7
Elasticity (%)	320	320	320	320	320	310	300
Surface Roughness (Rz)	9 µm	13 µm	8 µm	9 µm	8 µm	10 µm	10 µm

0044. Table 3.

NBR/NBR

	Ref. Ex. 2	Comp. Ex. 2	Practical Examples 6	7	8	9	10
Crushed Rubber Blended Ratio	0 wt %	10 wt %	10 wt %	30 wt %	50 wt %	70 wt %	90 wt %
Physical Properties:							
Hardness (JIS-A)	73	72	73	74	73	73	74
Tensile Strength (MPa)	13.2	12.0	12.6	12.1	11.7	10.9	10.3
Elasticity (%)	350	340	350	340	330	330	310
Surface Roughness (Rz)	6 µm	8 µm	6 µm	6 µm	6 µm	8 µm	7 µm

[Brief Explanation of Diagrams]

Figure 1. A process overview diagram showing the technique of this invention.

[Explanation of Reference Numbers]

11 Cylindrical extruded material (unvulcanized new rubber).

13 Vulcanized crushed rubber.

[Figure 1]

[words in the figure] Vulcanized Crushed Rubber